



Smart Tribal Farming for Sustainable Livelihoods in Churachandpur District, Manipur: A Community-Based Model for Tribal Agricultural Transformation

Pauchungnung Vaiphei*

Department of Political Science, Churachandpur College, Churachandpur, India

Abstract: Agriculture remains the principal source of livelihood for tribal communities in Churachandpur District, Manipur. Despite favorable agro-climatic conditions and abundant natural resources, agricultural productivity in the district remains relatively low due to dependence on traditional farming systems, inadequate irrigation facilities, poor market integration, limited mechanization, and weak institutional support. This study examines the existing agricultural practices and challenges faced by tribal farmers and proposes a Smart Tribal Farming Model tailored to the socio-economic and ecological conditions of the district. Primary data were collected through a baseline survey conducted in eighteen villages across Tuibong, Lamka South, and Singnat Tribal Development Blocks during November–December 2023. The findings indicate that low adoption of scientific farming practices, inadequate post-harvest infrastructure, poor access to agricultural inputs, and declining youth participation are major constraints affecting agricultural development. Based on these findings, the study proposes an integrated model incorporating climate-smart agriculture, precision farming, irrigation development, crop diversification, digital market linkages, women empowerment, and community-based institutions. The study argues that a localized smart farming approach can significantly enhance productivity, income generation, food security, and environmental sustainability while preserving indigenous agricultural knowledge and tribal cultural values.

Keywords: Smart Tribal Farming, Tribal Agriculture, Climate-Smart Agriculture, Sustainable Livelihoods, Churachandpur District, Manipur, Agricultural Innovation.

1. Introduction

Agriculture constitutes the backbone of rural livelihoods in Manipur, particularly among tribal communities inhabiting the hill districts. Churachandpur District, one of the largest districts in the state, is predominantly inhabited by indigenous tribal groups including the Vaiphei, Paite, Zomi, Hmar, Gangte, Simte, and several other communities. For generations, agriculture has served not only as an economic activity but also as a cultural institution that shapes community life, social relations, and food security.

However, agriculture in the district continues to face

numerous structural and environmental challenges. Traditional farming methods, while ecologically adaptive, often result in low productivity and limited marketable surplus. Increasing population pressure, fragmented landholdings, climate variability, declining soil fertility, and inadequate access to modern agricultural technologies have further constrained agricultural growth. These challenges have contributed to persistent rural poverty and growing migration of young people to urban centers in search of alternative livelihood opportunities.

Globally, the concept of smart farming has emerged as a transformative approach to agricultural development. Smart farming integrates information and communication technologies, precision agriculture, climate-resilient practices, and efficient resource management to improve productivity while minimizing environmental degradation. The application of smart farming principles in tribal areas has the potential to bridge the gap between traditional knowledge and modern agricultural innovations.

The present study seeks to develop a context-specific Smart Tribal Farming Model capable of addressing the unique challenges faced by tribal farmers in Churachandpur District while promoting sustainable agricultural development and livelihood enhancement.

2. Review of Literature

The concept of smart agriculture has gained prominence as an effective strategy for addressing the challenges of food security, climate change, and rural poverty. According to the Food and Agriculture Organization (FAO, 2023), climate-smart agriculture enhances agricultural productivity while strengthening resilience to climatic shocks and reducing greenhouse gas emissions.

Pretty (2018) emphasized that sustainable intensification allows farmers to increase productivity without expanding cultivated land, thereby protecting natural ecosystems. Similarly, Altieri (2019) argued that agroecological approaches integrating indigenous knowledge with scientific innovations

*Corresponding author: pauchungnungv@gmail.com

offer sustainable solutions for smallholder farming systems.

The World Bank (2023) highlighted that, digital technologies such as mobile advisory services, weather forecasting systems, and market information platforms can substantially improve farm decision-making and market access among rural communities. In the Indian context, the Ministry of Agriculture and Farmers Welfare has increasingly emphasized the adoption of precision agriculture, micro-irrigation, and farmer-producer organizations as mechanisms for improving rural livelihoods.

Despite these developments, research focusing specifically on tribal farming systems in Northeast India remains limited. Existing studies suggest that agricultural modernization in tribal regions must be carefully adapted to local socio-cultural and ecological conditions. Therefore, the development of a localized Smart Tribal Farming Model for Churachandpur District is both timely and necessary.

3. Objectives of the Study

The study was undertaken with the following objectives:

1. To examine prevailing agricultural practices among tribal farmers in Churachandpur District.
2. To identify key constraints affecting agricultural productivity and livelihood security.
3. To assess the level of awareness and adoption of scientific farming practices.
4. To develop a Smart Tribal Farming Model suitable for tribal communities.
5. To propose policy recommendations for sustainable agricultural development and rural transformation.

4. Methodology

The study adopted a mixed-method research design involving both primary and secondary data sources. Primary data were collected through a baseline survey conducted during November–December 2023 in eighteen villages distributed across Tuibong, Lamka South, and Singngat Tribal Development Blocks.

Data collection methods included:

- Structured questionnaires
- Personal interviews
- Focus group discussions
- Field observations

Respondents included farmers, village leaders, women's groups, youth representatives, and agricultural stakeholders. Information was collected on land ownership, cropping patterns, irrigation facilities, farm inputs, livestock management, marketing systems, and technological adoption. Secondary data were obtained from government reports, census publications, agricultural department records, and scholarly literature.

5. Profile of the Study Area

Churachandpur District occupies a strategic position in the southwestern part of Manipur and covers approximately 4,570 square kilometers. The district is characterized by undulating hills, fertile valleys, abundant rainfall, and rich biodiversity.

The majority of the population resides in rural areas and depends directly or indirectly on agriculture and allied activities for livelihood.

The major crops cultivated include:

Crop Category	Major Crops
Cereals	Paddy, Maize
Plantation Crops	Banana, Pineapple
Spices	Ginger, Turmeric
Vegetables	Seasonal vegetables
Pulses	Various local pulse varieties

Agricultural production is predominantly rain-fed, making farmers vulnerable to seasonal variations and climate-related risks. Mixed farming systems involving crops, livestock, and horticulture are commonly practiced.

6. Findings and Discussion

A. Farm Protection and Crop Losses

A recurring issue identified during field investigations was the absence of adequate fencing and farm protection measures. Crop damage caused by free-ranging livestock and wild animals significantly affects productivity and discourages investment in commercial agriculture.

B. Low Adoption of Scientific Farming Practices

Although some farmers have adopted improved agricultural methods, the majority continue to depend on traditional cultivation systems. Limited access to extension services has resulted in low awareness regarding improved seed varieties, integrated pest management, soil testing, and crop rotation techniques.

C. Inadequate Access to Agricultural Inputs

Farmers frequently encounter difficulties in obtaining certified seeds, fertilizers, pesticides, and farm machinery. Such constraints reduce productivity and increase vulnerability to pests, diseases, and climatic shocks.

D. Irrigation Constraints

The dependence on monsoon rainfall limits opportunities for multiple cropping and year-round cultivation. Villages with access to irrigation facilities reported comparatively higher productivity and income levels.

E. Market and Infrastructure Challenges

Poor road connectivity and the absence of organized marketing systems restrict farmers' access to profitable markets. Most agricultural products are sold through intermediaries, resulting in lower returns to producers.

F. Youth Migration and Agricultural Decline

The study observed increasing disinterest among rural youth toward agriculture. Many perceive farming as labor-intensive and economically uncertain. Consequently, migration to urban areas and neighboring states has become a common livelihood strategy.

G. Proposed Smart Tribal Farming Model

The proposed model is designed around ten interconnected components.

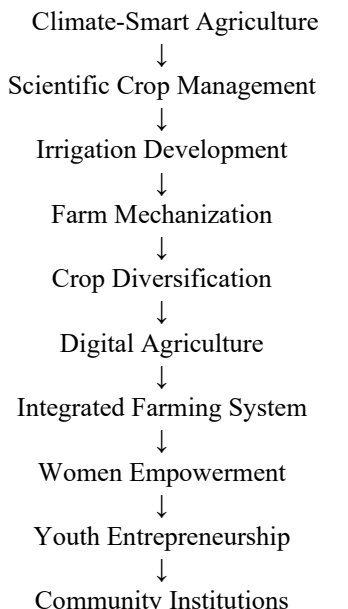


Fig. 1. Smart tribal farming framework

7. Core Components

1. Climate-Smart Agriculture
2. Precision Crop Management
3. Community Irrigation Systems
4. Farm Mechanization
5. Crop Diversification
6. Digital Agriculture Platforms
7. Integrated Farming Systems
8. Women-Led Agricultural Enterprises
9. Youth Agribusiness Development
10. Farmer Producer Organizations (FPOs)

These components collectively address production, marketing, sustainability, and institutional challenges identified during the survey.

8. Expected Outcomes

Implementation of the Smart Tribal Farming Model is expected to produce several socio-economic and environmental benefits:

Table 2

Expected Outcome	Impact
Increased productivity	Higher crop yields
Enhanced income	Improved household welfare
Food security	Better nutrition and resilience
Youth participation	Reduced migration
Women empowerment	Greater economic inclusion
Market integration	Improved price realization
Resource sustainability	Conservation of soil and water
Climate resilience	Reduced vulnerability to shocks

The model promotes agricultural transformation while preserving indigenous ecological knowledge and cultural traditions.

9. Policy Recommendations

- 1) Establish Smart Tribal Farming Demonstration Centres in each development block.
- 2) Expand micro-irrigation and rainwater harvesting infrastructure.
- 3) Promote Farmer Producer Organizations and agricultural cooperatives.
- 4) Strengthen agricultural extension services through digital platforms.
- 5) Introduce entrepreneurship training programs for tribal youth.
- 6) Facilitate access to low-interest agricultural credit.
- 7) Develop village-level storage and processing facilities.
- 8) Encourage organic and climate-resilient farming practices.
- 9) Promote public-private partnerships in agricultural value chains.
- 10) Strengthen collaboration between universities, research institutions, and farming communities.

10. Conclusion

The future of agriculture in Churachandpur District depends upon the ability of tribal communities to successfully integrate indigenous agricultural wisdom with modern technological innovations. The study demonstrates that while tribal farmers possess considerable agricultural potential, structural constraints continue to limit productivity and livelihood opportunities. The proposed Smart Tribal Farming Model offers a practical and sustainable pathway for agricultural transformation by combining climate-smart practices, digital technologies, community participation, and institutional strengthening. Such an approach can contribute significantly to rural development, poverty reduction, food security, and environmental sustainability in Manipur and other tribal regions of Northeast India.

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